Learning Arithmetic Facts Can Be Fun

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This year I think I know how the Pied Piper must have felt. The magic word is "arithmetic" and the wonderland is a room filled with numeral cubes, equation cards, math wagons, answer boards, walk-on multiplications tables, and other arithmetic games, gimmicks, and manipulative devices. With a specific arithmetic objective, students are guided through a series of game activities. Motivation is high and participation is often intense. An atmosphere of excitement pervades the room. On top of all this, the students are learning arithmetic concepts and skills.

Do your students eagerly look forward to math time? After working with students in Grades I through VI, in both regular and special education programs, I am convinced that it can be one of the high points of the day. All it takes is some imagination, a little creativity, and daring. Perhaps if I relate some of my experiences, you may be inspired to come up with a new set of ideas for teaching arithmetic. I sometimes use commercial games, but I rely heavily upon my own games and activities, because it is sometimes easier to create a game that meets both my objectives and the needs of my students than it is to find one already made that does the same job.

Let's start with learning the basic facts. Drill can be deadly, yet sometimes it is a necessity. The answer is to vary the drill and make it fun. I frequently use numeral cubes, because they are a manipulative device that students can handle. They provide the element of chance and surprise, yet give teachers some control of the numbers that appear. You can make numeral cubes from tagboard or strips of lumber sawed into cubes.

Let's take a situation in which students are working with the addend 3. The teacher can place 0, 1, 2, 3 on the cube, repeating two of the numbers. Then a large 3 is placed on the table. The student rolls the cube, uses the number which appears, adds it to the 3, and gives the sum. For instance, if a 2 appears on the cube, the student says "2 + 3 = 5".

If the student is working on missing addends, the teacher can place a sum on the table and mark on the cube those numbers which could be one of the addends. The student rolls the cube, uses the number which appears as one of the addends, and then supplies the missing addend to make the equation.

In multiplication, place one of the factors on the table. Then have the student roll the cube for the other factor. Next he should multiply the two factors and supply the product. The next step is to roll two cubes, use the two numbers that appear, and then complete the equation.

Using two cubes is a less controlled situation, because there are two variables. I keep on hand four numeral cubes, two marked 0-5 and two marked 5-10. I can then have students use the two low cubes, one low and one high, or two high cubes, depending upon the level at which they are working or the degree of difficulty they are experiencing.

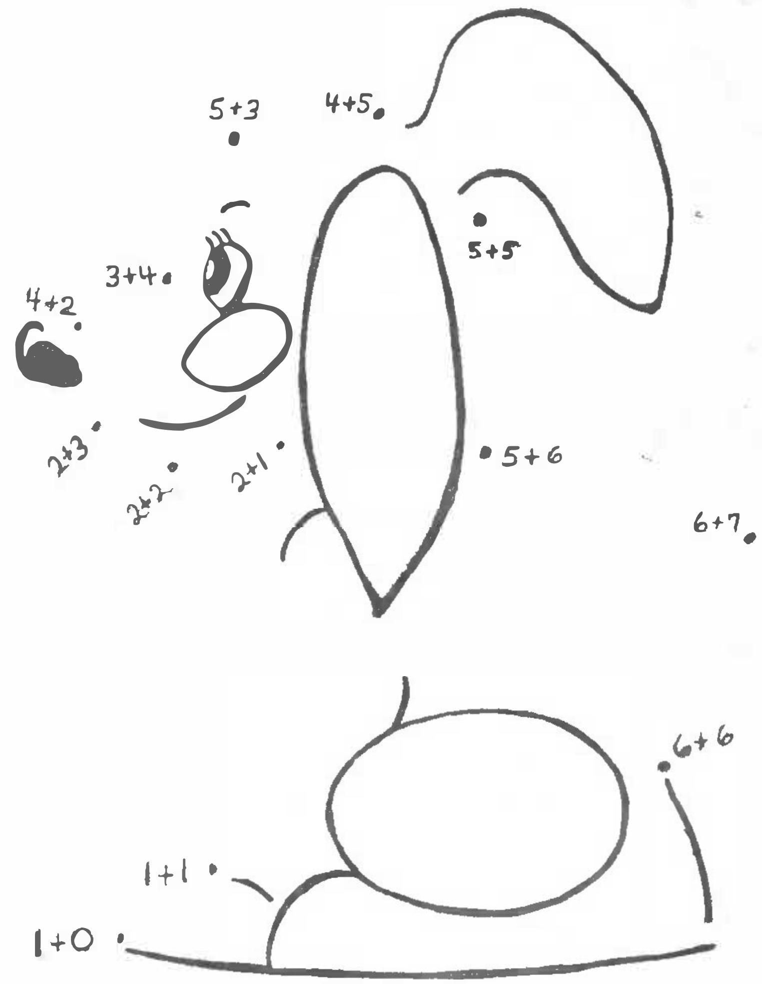
You can devise many different games using numeral cubes. Give a player a point for each correct answer, or give a point only if the answer is given in a certain length of time. Try having the players in a circle with one player standing on the outside. As the players take turns with the cubes, the player on the outside tries to give the answer before the seated player does. If he succeeds, they exchange places. Or try it the other way. Have the winner remain standing. He can then challenge each player in turn. You could also use a team situation. Be sure to have each player say the whole equation out loud, not just the answer. By saying the whole equation he sees it, he says it, and he hears it. The other players also see it and hear it. After a while the answer becomes an automatic response when the equation is given.

Frequently I use numeral cards along with numeral cubes. Many things can be done with a set of 11 cards (numbered 0-10) and a pair of cubes. I am currently working with a group of Grade I pupils who were having difficulty in grasping the concepts of greater than and less than. The cards are placed in a row as on a number line. Two cubes (numbered 0-5) are rolled. One cube is matched with its corresponding number on the cards. The other cube tells the number of cards greater than the one which is matched with the first cube. The child moves the second cube to the correct number of cards to the *right*. The answer is where the second cube lands. For instance, if a 2 and a 5 are rolled, the child could match the 5 cube with the 5 card and move the second cube two spaces to the right to find out that 2 greater than 5 is 7. To familiarize students with the concept of less than, use a red cube (numbered 0-5) and a blue cube (numbered 5-10). Have students match the blue cube with its card and move the red cube to the *left* to find the answer. For instance, if a blue 9 and a red 3 appear, the student should match the 9 cube with the 9 card and move the 3 cube three places to the left. This shows that 3 less than 9 is 6. The child should always try to verbalize what is taking place.

Two provide practice in addition, place the 11 cards face up in front of each student in a small group. These represent the sums. Have each take turns rolling and turning over the card which corresponds to the sum of the two numbers rolled. The person who gets all the cards turned over first wins the game.

With students who know multiplication, I use the cubes as place holders. In this way, if three cubes are rolled and the numbers 2, 5, and 7 appear, they can be arranged to form the numbers 2, 5, 7, 25, 27, 52, 57, 72, and 75. (They can even be used to form three-digit numbers such as 257 and 527.) These numbers now become products, and the cards represent factors. A player's turn begins when he rolls the cubes. It ends after he has turned over all the factors he can find in the products he can arrange with the cubes. In this case he could turn over the 1 card, because 1 is a factor of all the numbers. He could turn over the 2, because 2 x 1 = 2; 5, because 5 x 1 = 5 and 5 x 5 = 25; 7, because 7 x 1 = 7; 3 and 9, because 3 x 9 = 27; 8, because 9 x 8 = 72; and so on. A player may be challenged. If he cannot give the equeation he used in turning over one of the factors, he loses that point, whether or not that card is a factor of one of the numbers arranged using the cubes. Give a point for each factor found. Each time the cubes are rolled, a new set of products can be formed and new factors can be found. This is a good way to introduce division.

How about paper and pencil games? Give younger students dot-to-dot pictures. Instead of numbers to be joined in sequence, place equations whose answers provide the sequence of numbers to follow for the picture. For instance, to go from the start to the first point, the student finds the equation whose answer is 1. He draws his line segment from the start to this point. Next he goes to the point whose equation gives the answer 2. Here's an example.



Puzzle pictures are fun, too. Divide a picture into puzzle pieces. Each piece contains an equation. Instructions may be to color in red all those pieces whose answer is 3; to color blue all those pieces whose answer is 5;

to color yellow all those pieces whose answer is 6; and so on. In two-color pictures (a Halloween pumpkin, for instance) all pieces with even answers are to be one color and all pieces with odd answers are to be another color.

Students of all ages can do graphs. The picture you give on the graph paper and the difficulty of the problems are determined by the age and ability level of your students. Number the spaces, not the lines, on the graph paper. If you want students to fill in the space which is over 3 and up 5, the first pair of equations should have solutions of 3 and 5 in the "over" and "up" columns respectively. You can make your own graphs by drawing a picture on the graph paper and then squaring it off to correspond to the squares on the paper. Then plot your points and make up your problems. If you are working with multiplication and you want an answer of 33, you can use not only 3 x 11, but (4 x 8) + 1, (6 x 6) - 3, (4 x 9) - 3, (5 x 7) - 2, (4 x 4) + 17, 3 + (6 x 5), or other combinations.

How about secret messages? Mark down the alphabet and give each letter a numerical value. Then write out your message using equations whose answers are equal to the letter value you want. For instance, suppose you make a=1, b=2, and so on. If your first word is "Do", your first problem should have the answer 4 and your second problem should have the answer 15. Students would then solve the first equation to get the answer 4 and substitute "D" for the 4. Next they would solve the second equation and trade the answer 15 for an "o". Presto! The first word of the message. I once used this method to ask students if they wanted a party. They had to give me their answer in code. I would accept no verbal or written answer using words. The whole class ended up at the party! I've also used this method to present riddles to a class. After a few chuckles, they began making up their own riddles to give to others. (By the way, "a" doesn't always have to equal 1.)

Here's an example.

Solve the problems to read the message. Substitute the letter that corresponds to each answer. (● means a new word begins.)

A = 1	N = 14
B = 2	O = 15
C = 3	P = 16
D = 4	Q = 17
E = 5	R = 18
F = 6	S = 19
G = 7	T = 20
H = 8	U = 21
I = 9	V = 22
J = 10	W = 23
K = 11	X = 24
L = 12	Y = 25
M = 13	Z = 26

1. (6x4)-1 =

2. $\frac{1}{2}$ x 16 =

3. $\frac{1}{3}$ of 15 =

4. 7 x 2 =

5. 5 x 5 =

6. $\frac{1}{3}$ x 45 =

7. 7 x 3 =

8. 12 ÷ 2 =

9. 3 x = 27

10. ÷ 2 = 7

11. 4 x = 36

12. (4x5)-1=

13. 7 x = 56

14. (5x4)x1 =

15. $\frac{1}{3}$ x 24 =

16. $\frac{1}{2}$ x 18 =

17. (4x4)+3 =

18. 5x5 ÷ 1 =

19. $\frac{1}{3}$ of 45 =

20. 7x6 ÷ 2 =

21. (3x4)+1 =

22. $\frac{1}{2}$ x 2 =

23. (3x7)+4 =

24. 7 x = 28

25. 3 x 5 =

26. 7 ÷ 7 =

27. 9 x 2 =

28. $\frac{1}{4}$ of = 5

For students who need to be active, try making a number chart or a multiplication chart on a large sheet of plastic. Place it on the floor. Then have the student give the answer to a problem, either from flash cards or cubes, and try to hit the answer on the plastic with a bean bag. You can also paint numerals on a large piece of formica from a lumber yard or on a chart which has been laminated with plastic and taped to the blackboard. Have the child try to hit the answer to his problem with a dart attached to a suction cup. These large muscle activities are great for students who need to get rid of excess energy.

In devising a game activity, if you can't think of the problems to use, take the problems from your textbook. You can always adjust the answer by adding or subtracting the amount needed. If a student is having difficulty with a certain concept, the same type of problem can be used in enough ways so that he does not become bored. If your school lacks funds to invest in commercial games, make your own. If you can't seem to get any ideas, look at other games and think of how they can be adapted to arithmetic. (We have some great games of "Equation Rummy" and "Equation Fish" going at times.) If you think you are not creative, think again. Good luck, and have fun!

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